User's Manual

GeekKlok Accessory Module (GAM)

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DOCUMENT REVISION HISTORY

Revision 0.8
Preliminary and limited release before hardware is ready. For evaluation.

Revision 0.91
Added U56 and changed firmware to support more alarm features, such as:
- individual alarm outputs on connector J92
- individual 15-minute chime enable signals on pads (no connector)
- ability to set alarm beep to zero minutes duration, so it is silent alarm, only enabling the J92 pin

Clarified alarm tones and what happens with overlapping alarms.

GeekKlok Accessory Module

DESCRIPTION

The GeekKlok Accessory Module (hereafter called GAM) is a small printed circuit board that contains a 16-pin microcomputer, additional circuitry and a place for two numeric Nixie tubes for display of seconds. The GAM adds functionality to the GeekKlok, including display of seconds, annunciation of time with two different chime schemes and several different chime sounding schedules, up to four recurring alarms or reminders with distinctive tone patterns, and an input for connection to a passive infrared sensor (PIR) module so that the GAM and GeekKlok can be blanked after a preset time when no motion is detected in the room. A number of user setting registers are provided for programming alarm times and occurrence schedules, as well as other user preferences. These registers can be stored in nonvolatile flash memory within the GAM.

Note: The GAM requires the GeekKlok to have Version 1–5 or later firmware. The alarm will not function properly with earlier versions. (Very early versions will simply not work at all (seconds will keep counting 00-99).)

OPERATION AND SETTINGS

When the GAM is connected to the GeekKlok it will display seconds. For the first minute after connection it may not be correct (see circuit description), but after one minute has passed the seconds should always follow the GeekKlok minute changes. There are two tactile switches marked SET and ADV which have functions similar to the buttons with the same names on the GeekKlok. These are used to access internal setting and preference registers, and to silence an alarm condition.

USER REGISTERS

Pressing the SET button from a normal seconds display enters the register editing mode. Since there are only two digits on the GAM display, the register number is displayed first for about one second and then the contents of the register are shown. At this point the ADV button can be used to step or advance through the possible values for each register. Holding the ADV button down steps through the values automatically.

In the following list the registers are numbered from R70 through R91. The numbers in parenthesis show the range of acceptable values for each register. The four alarms or reminders are named 1 through 4.

R70 Alarm 1 Hour (00..23). The hour follows a 24-hour system even if the GeekKlok is set to 12-hour display mode. This is consistent with internal registers in the GeekKlok, which also use the 24-hour cycle for settings.

R71 Alarm 1 Minute (00..59). This is the minute of the hour set by R70 when the alarm begins to sound.

R72 Alarm 1 Day Selection (00..18). This register selects on which days of the week the alarm will sound. All alarms are self-resetting, meaning that they are ready to sound again as soon as they are silenced or as soon as they automatically silence themselves. Note that the GeekKlok must use the convention for its register DW setting where day 1 is Sunday.

- 00 = never sound alarm (initial setting)
- 01 = Sunday only (on the other six days this alarm will remain silent)
- 02 = Monday only
- 03 = Tuesday only
- 04 = Wednesday only
- 05 = Thursday only
- 06 = Friday only
- 07 = Saturday only
- 08 = Monday through Friday
- 09 = Monday through Saturday
- 10 = Every day of the week
- 11 = every day except Sunday (same as 09)
- 12 = every day except Monday
- 13 = every day except Tuesday
- 14 = every day except Wednesday
- 15 = every day except Thursday
- 16 = every day except Friday
- 17 = every day except Saturday
- 18 = Saturday and Sunday

R73 Alarm 1 Minutes to Auto-silence (0..99). When an alarm sounds, it can be manually silenced by pressing the ADV button. If it is not silenced manually it will stop sounding after the number of minutes programmed into this register. This keeps the alarm from sounding for hours (some commercial clocks do this) or only sounding for one minute (other commercial clocks do this). We know of no clock that offers a variable and programmable auto-stop setting for the unattended alarm. If set to zero the alarm will not sound on the built-in beeper, but the output signal on J92 will be active for the duration specified in R74.

R74 Alarm 1 External Pin Minutes (01..99). Output on J92 pin active for duration in R74

The next four registers are for Alarm 2. They have the same functions as those described for Alarm 1.

R75 Alarm 2 Hour (00..23).
R76 Alarm 2 Minute (00..59)
R77 Alarm 2 Day Selection (00..18)
R78 Alarm 2 Minutes to Auto-silence (0..99)
R79 Alarm 2 Minutes External Pin Active (1..99)

The next four registers are for Alarm 3. They have the same functions as those described for Alarm 1.

R80 Alarm 3 Hour (00..23).
R81 Alarm 3 Minute (00..59)
R82 Alarm 3 Day Selection (00..18)
R83 Alarm 3 Minutes to Auto-silence (0..99)
R84 Alarm 3 Minutes External Pin Active (1..99)

The next four registers are for Alarm 4. They have the same functions as those described for Alarm 1.

R85 Alarm 4 Hour (00..23).
R86 Alarm 4 Minute (00..59)
R87 Alarm 4 Day Selection (00..18)
R88 Alarm 4 Minutes to Auto-silence (0..99)
R89 Alarm 4 Minutes External Pin Active (1..99)

The next four registers set various preferences for the Chime Annunciation. For further information on the chimes, see the separate description of ALARM AND CHIME SOUNDS.

R90 Hourly Chime Occurrence (00..03)
0 = no chime
1 = hourly (chimes when minute = 00)
2 = half-hourly (chimes when minute = 00 or 30)
3 = quarterly (chimes when minute = 00, 15, 30 or 45)

R91 Daily Chime Occurrence (00..07)
0 = opposes blanking in GeekKlok, chimes when display is not blanked.
1 = follows blanking in GeekKlok, chimes when display is blanked.
2 = silent 21:00 to 08:59
3 = silent 22:00 to 07:59
4 = silent 23:00 to 06:59
5 = silent 00:00 to 05:59
6 = silent 01:00 to 04:59
7 = chimes all 24 hours

R92 Solo Chime Mode or Morse Code Chime Mode (01..04)
1 = Morse 12-hour mode
2 = Morse 24-hour mode
3 = Solo Chime normal
4 = Solo Chime alternate 1:xx and 2:xx signals

R93 Morse Speed. (01..05)
1 = 10 WPM These preset speeds are in 42% steps. This register is not used for Solo Chime Mode.
2 = 14 WPM
3 = 20 WPM
4 = 28 WPM
5 = 40 WPM

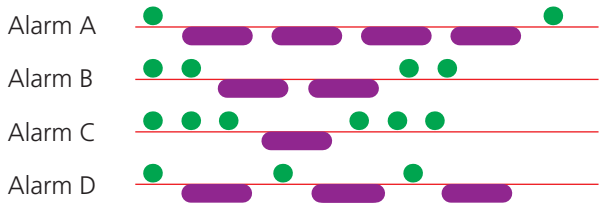
R94 Blanking Delay. This sets the delay from when the PIR input goes low until the GAM seconds display is turned off (blanked) and a "BA" command is sent to the GeekKlok to blank the GeekKlok. With GeekKlok version 1–6 firmware or later, the blanking can include a dim mode; this dim mode is not supported on the GAM, and the GAM will always totally blank the seconds digits.

R95 Save to Flash? If the value is 00 then the changes are only retained in RAM temporarily. If R91 is set to any nonzero value, all of the registers are saved to Flash memory when exiting the register editing session after register 91. In other words, pressing the SET button after R91 will return to the seconds display, with the changed register contents saved or not saved to the backup memory.

ALARM AND CHIME SOUNDS

The single Piezoelectric transducer is used for producing both chime tones every 15, 30 or 60 minutes for annunciation of the time as well as signalling the alarms. The chime annunciation can use either Morse Code or our own proprietary Solo Chime scheme.

Alarms. There are four alarms and each one has a distinctive pattern that most people can learn to differentiate. Similar to Morse Code, the alarm sounds consist of short and long tones, the short ones being of a higher pitch than the longer ones. In fact, some of the alarms represent Morse Code punctuation symbols, though it is not necessary to know these as such.



Morse apostrophe

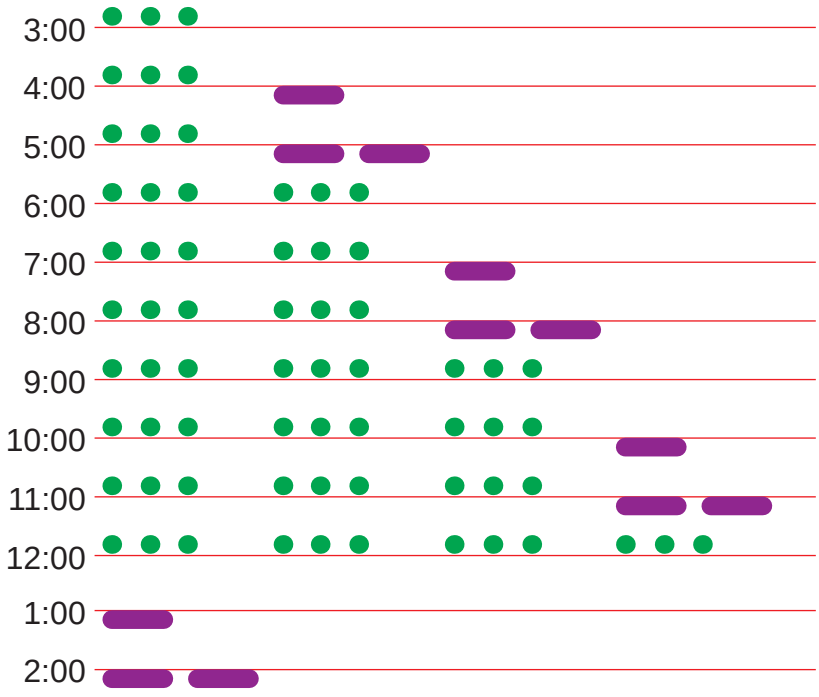
Morse question mark

(no Morse equivalent)

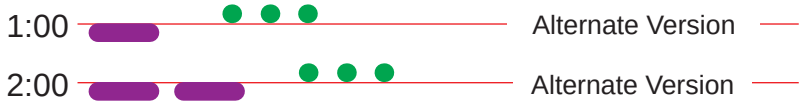
Morse period or full stop

Solo Chime. The Solo Chime concept was first developed for the Cyclochron clock in 1991. It uses a combination of elements from Morse code and music, combined in a way to provide a patterns that form a Gestalt whose overall shape or character is relatively easy to remember. It does this by using two musical pitches or notes, a high one (shown below in green) and a low one (shown in purple). The hour in the 12-hour cycle is divided by three and the quotient is used to count off a number of three-note (triplet) patterns. In this division if there is a remainder, that is used to play longer beeps of a lower pitch. The triplets actually have the same number of beeps as the hour when the hour is 3, 6, 9 or 12, but by grouping them they change from a robotic beating of the hour to a more logical and distinctive pattern. Thus if the hour is six, there will be two triplets played; if the hour is seven there will be two triplet patterns played plus a single lower tone for the remainder; if the hour is eight there are two low notes after the two triplets.

This can best be illustrated graphically for each of the 12 hours:



This chart starts at 3:00 so that the process of adding the remainder from the division can be seen. When the time is 1:00 and 2:00 the division of the hour by three results in a zero quotient, so no triplet pattern is played. However, the single and dual tones in this case are not very distinctive, so an option is provided which adds a triplet to the end of the single or dual low tones, essentially playing 4:00 and 5:00 in reverse.



The alternate Solo Chime sequence for 1:00 and 2:00 may be selected by setting register R92 to 4.

The patterns shown play four times on the hour, once at the 15-minute point, twice at 30 minutes and three times at the 45-minute point. This is exactly the same as the four phrases in the classical Westminster melody, which conveys no hour information, only indicates the current quarter of the hour. With the Solo Chime scheme you know the hour and the minutes, and since the pattern has a rhythmic and melodious Gestalt, it is possible to play it back in one's memory if one was not paying attention fully when it played. The Westminster Bongs on the hour have to be carefully counted (particularly when the hour is greater than about six or seven), since there is no grouping done.

Morse Chime. The Morse chime mode can be set to "spell out" the time in either 12-hour format or in 24-hour format. This is independent of the jumper setting on the GeekKlok that determines the display mode. The speed in WPM (words per minute) is settable from five preset speeds that are uniformly spaced in 42% steps (i.e., each one is approximately 42% faster or slower than the adjacent step). The speeds are 10, 14, 20, 28 and 40 WPM.

Note on overlapping alarm settings. If an alarm is active and sounding none of the other alarms can sound, since the beeper is still in use to process the first alarm's tone signal. The individual external alarm enable pins on J92 will correctly work for overlapping alarms and their register settings for these enable durations.

CIRCUIT DESCRIPTION

The GAM uses a Freescale (formerly Motorola) MC68HC908KX2 microcomputer, which contains a full serial UART subsystem, two timers, four A/D converters. It has 2048 bytes of flash memory and 192 bytes of RAM. It operates with an internal clock, calibrated to run close enough to a specific frequency so that the serial UART can be used without requiring an external crystal.

The nixie data is sent over a serial peripheral interface (SPI) to a 74HC595 shift register (U53) as two four-bit binary-coded-decimal numbers. The outputs of the shift register connect to vintage nixie driver ICs, 7441 or 74141. The serial output of U53 connects to a second shift register, U56, which is used to produce enable outputs for each of the four alarms and each of the quarter-hour chime occurrences. Once each second data is sent to both of these shift registers, first one byte for the alarm enable outputs and secondly one byte for the nixie drivers.

The tone generator consists of an "hysteresis" oscillator and associated components to produce two tones. The second tone is engaged by turning on Q25.

High voltage power from the GeekKlok is turned on and off (for blanking the seconds) by means of a two-stage switch consisting of Q32 and Q33. The two setting buttons are read on the microcomputer inputs, which have internal pullup resistors.

The microcomputer serial output that is to connect to the GeekKlok is turned into an open collector, active-low signal by transistor Q34. If the GeekKlok has the RS232 option added (using a MAX232 or equivalent), then this line uses the MAX232 output, through a series resistor, as a pullup. Since the serial input to the GeekKlok is so seldom active, these two different sources of serial data can be merged or "wire-ORed" together with no ill effects.

CONNECTIONS

The GAM connects to the GeekKlok via connector J91. This is marked J91 on both the GAM and GeekKlok. On revision B boards for GeekKlok this connector has seven pins, but on all earlier revisions J91 only has five pins. Of the missing two pins, only one is actually used and will need to be soldered to the correct point on the GeekKlok.

On GAM, J91 has these pin connections:

pin 1: High voltage, +170 to 190 volts from the GeekKlok power supply.
pin 2: Five volts (+5v) for the logic and microcontroller.
pin 3: GTxD, GeekKlok serial Transmit Data. This is a TTL/CMOS level signal that comer directly from the GeekKlok's microcomputer.
pin 4: Ground common.
pin 5: T1Hz. This is a pulse from the GeekKlok microcomputer at the rate of one pulse per second.
pin 6: Battery. This connects to the lithium cell on the GeekKlok. It is not used and the wire may be omitted when connecting the GeekKlok to GAM.
pin 7: GRxD, GeekKlok serial Receive Data. This connects directly to the GeekKlok's UART input pin on the microcomputer. This is a TTL/CMOS level signal. It only sends data from the GAM when the PIR timer has reached the limit set by register R90 and blanking is to be enabled (it sends "BA" as a command), or when the PIR input goes active high after a blanked period (it then sends "BZ" as a command).

The second connector on GAM, J92, is for potential connection of user-supplied external equipment to GAM. These pins will be described in greater detail:

pin 1: Alarm Tone. This is a square wave audio-frequency tone that is derived from chime and alarm oscillator, but gated by U52 so that it only carries the audio square wave when an alarm is sounding, but not when a

hour chime sounds. This could be connected to an amplifier to make the alarms louder. When not active it is a logic high level.

pin 2: Alarm Enable. This output signal goes active high when an alarm is sounding. It does not follow the keying of the tones with the four distinctive alarm codes. This may be used for whatever external alarm equipment is desired (e.g., turn on a motor to shake your bed).

pin 4: Chime and Alarm Enable. This output is an active-high level that follows the keying of the alarm and chime tones. If externally ANDed with Alarm Enable (J92 pin 2), it will be a keyed signal only active for alarms and will carry the alarm code (dot-dash character).

pin 4: Ground. This is the circuit zero-volt common point.

pin 5: PIR sensor input. This is intended to connect to a logic output of a PIR sensor that senses motion of people in the room. A logic high level means that motion is detected. The signal goes low when the detector does not pick up any motion in the room. When low an internal timer runs and will blank the GAM and GeekKlok when the number of minutes set by register R90 is reached. If PIR goes high even for a brief moment, the counter is restarted from zero. Other motion sensors or combination of sensors may be used, such as ultrasonic Doppler or microwave Doppler sensors. The input on this pin may be a TTL/CMOS level signal or an open collector (or open drain) signal, as there is an internal pullup resistor on the input to the microcomputer.

pin 6: Power supply +5 volts. This power comes from the GeekKlok, and is limited to about 50 milliamperes. It is intended to supply a small amount of power to a PIR sensor.

pin 7: Alarm 1 External Enable. This pin goes active high when Alarm 1 is active. It follows the time, in minutes, programmed into register R74. Silencing the alarm by means of the ADV button, or waiting for auto-silence as sent by register R73, has no effect on this output. It always follows the R74 register duration.

pin 8: Alarm 2 External Enable. This pin goes active high when Alarm 2 is active. Except for the alarm number, it is identical in operation to the Alarm 1 External Enable described for pin 7.

pin 8: Alarm 3 External Enable. This pin goes active high when Alarm 3 is active. Except for the alarm number, it is identical in operation to the Alarm 1 External Enable described for pin 7.

pin 10: Alarm 4 External Enable. This pin goes active high when Alarm 4 is active. Except for the alarm number, it is identical in operation to the Alarm 1 External Enable described for pin 7.

NIXIE TUBE SELECTION AND TIPS

The GAM has footprints for three different nixie tube types. Since all numeric nixies can be driven by the same 7441 or 74141 driver ICs, considerable flexibility is provided. Unfortunately, the same 14-segment alphanumeric tubes, B-7971, as used in the GeekKlok itself, can't be used without adding a diode matrix to make a seven segment (or other segmented) numeric display. Because such tubes would be fixed to the one font they would not participate in font changes and animation. They might also confuse the observer since they will not blank during display of the date. Smaller numeric nixies are less likely to confuse the observer.

The circular ring of 13 holes nearest the board edge, marked ZM1040, are intended for use with this tube and several others that share the same pinout and socket footprint. Besides the ZM1040, these include ZM1042, Z522M, Z5220M, Z566M, and Z5660M. The holes are designed to take the Mill-Max or Tyco socket pins mentioned in the GeekKlok parts list notes (at the bottom of the page).

Inside the same circular ring is a set of smaller holes for the solder-in B-5750 series of tubes. They are, unfortunately, spaced rather far apart, besides being very small, but this was an easy way to give just one more bit of flexibility to the kit builder.

The circular ring of 13 holes behind the ZM1040 ones is for short end-view tubes. These are more common than the side view tubes. They include the ZM1020, 6844A, B-5092, GN-4, GR10M, 8037, 8421, 8423, B-5031, B-5037, B-5092, B-5092A, B-6033, B-6091, B-6844A, B-7153, B-50347, BD-206, BD-302, CD24, CD26, CD102, CV5278, CV9316, CV9732, F9057, F9057AA, GN-3, GN-4, GN-4A, GN-4D, GR10M, HB-106, LC-511, M2726-102500, NUP-102, NUP-118, Z510M, Z520M, Z560M, Z5100M, Z5200M, Z5600M, ZM1020, ZM1022 and probably more. When these are used it is necessary to mount the GAM board vertically. If the baseline of these seems too high, the ZM1040 footprint part may be cut off with a saw.

Other nixies may also be used, but the builder will have to provide sockets and wire them to the row of pins near the 7441 ICs. There are two rows of solder pads there. If another type of tube that fits the 13-hole ring is used, but requires different pin connections, the jumper between the two rows may be cut. This can easily be done by drilling out the plated-through holes or cutting the tracks. Then jumper wires can be used to route the driver outputs

to the new pins Alternatively, a single-row pin connector may be installed in these holes to connect to a remote socket for some other tube type, such as the Russian IN-18.

Resistors R9 and R10 should be selected for the current requirement of the nixies that you use. Typical values might lie in the range from around 18k to 39k for anode currents ranging from 2.5 mA to 0.8 mA, respectively. Since maintaining voltages for nixies are usually very close to 140 volts, and with 170 to 185 volts from the GeekKlok, that represents a drop of 30 to 45 volts. This is the value to use in Ohm's Law to calculate a resistance for R9 and R10.

For example, if the Nixie tube anode current is specified to be 2 mA at an ionisation voltage of 140 volts, then the remaining voltage from 180 volts, i.e., 180–140 = 40 volts, is drop accross the resistor, so R = 40 divided by 2 mA (0.002 A), which is a resistance of 20 kilohms.

If the anode current to a Nixie tube is too low the entire digit might not glow, but that can also be a symptom of cathode poisoning or lengthy storage. Cathode poisoning can often be cured if not severe by simply running the tube for a week at normal current, or that doesn't restore full digit glow, by increasing the current to about three to five times for from five to 20 minutes, then reducing it again to normal and checking; repeat once or twice again ifnecessary, but more than that probably is indicitave of a tube that simply can't be repaired. Additional info on this is available in the archives of the Neonixie-L Yahoo Groups mail list. (Do a Google search for "Neonixie".)

If the anode current is too high the tube will seem unusually bright and will run more than just slightly warm to the touch. Note that a blue or violet glow is not necessarily indicative of excessive current, since many Nixies were made with mercury vapour added to the neon gas mixture to prolong the tube lifetime. If the current is within specifications and there is a blue tinge to the neon glow, it is probably not a problem. However, reducing the current may reduce the blue glow and even further increase lifetime. (In the days when Nixies were designed into equipment, a red-orange filter was often used to improve contrast and eliminate the blue colour if the tubes had mercury.)

ADDITIONAL SUGGESTIONS — PLEASE READ

Setting buttons. The setting buttons (SET and ADV) may not be in the most convenient location for all physical mounting possibilities that may be chosen by builders. The switches can be mounted on the opposite side of the PCB, of course. If it is desired to mount them in a more remote location, and if the distance is less than about eight to ten centimeters (2.5 or 3 inches), the switches may simply be connected with wires to the PCB pads for the switches, ideally with twisted-pair wire. If the distance is greater it might be best to substitute a simple NPN transistor for the switch on the PCB and use the remote switch to feed some base current into the transistor when the button is pressed. The button inputs go directly to the microcontroller with very weak pullup resistors, so the resulting impedance is quite high and this susceptible to noise pickup when the switch is not pressed (which, of course, is most of the time).

PIR input from sensor or button. If the PIR input is not used, it may be left unconnected, since a pullup resistor is provided to simulate an ever-present infrared target. If the clock is to be used as a press-to-read clock, with it always going blank after a preset time (per register R94 setting), regardless if there is someone in the room, then a pulldown resistor to ground of about 10k may be used on the PIR input to simulate no presence of any object, with the button (or toggle switch) connecting the PIR input to +5v to simulate a detected target. The existence of the dimming mode in the GeekKlok (Version 1–6 or later) makes this a viable option.

Dimming seconds digits. If dimming of the seconds is preferable to fully blanking them, a resistor may be connected from the emitter to collector of Q32. However, note that reducing current to nixies may yield incomplete digit glow or a fuzzy and unfocused glow before the desired dim level is reached. This is a fact of life for nixie tubes. The dimming in the GeekKlok is done by varying the on/off duty cycle of the driver without reducing the current. This always yields sharp and complete cathode coverage. This mode of nixie dimming is not supported in the GAM.

Connectors. The connectors may be mounted on either side of the PCB, but it types having a polarizing wall, such as Tyco/AMP "MTA" or Panduit Mascon are used, note that reversing them to the other side of the board also requires reversing the side where the polarizing wall is located, in order to preserve the pin numbers. Of course, the pin numbers are also arbitrary, so the polarizing wall could be reversed and the pins renumbered. Note that the +170 volts high-voltage is on one of the J91 pins and if misconnected could portentially cause some damage to the GAM. Double check pin connections and double check for proper mating of connectors each time that J91 is removed.

GeekKlok PCBs below Revision B. Earlier GeekKlok PCBs did not have the extra pin on J91 for the GRxD signal. (It was not expected that the GAM would talk back to the GeekKlok to control dimming or blanking.) If U95 is not used (no RS232 option has been installed) then connect J91 pin 7 on GAM to U95 pin 12 on the GeekKlok. R24 (which is numbered R100 on early PCBs before Rev A) is required as a pullup, and is probably present. If, however, U95 is present then the problem is slightly more complex. A track on the GKK should be cut and an additional resistor added. See the partial schematic at the end of this manual for further info.

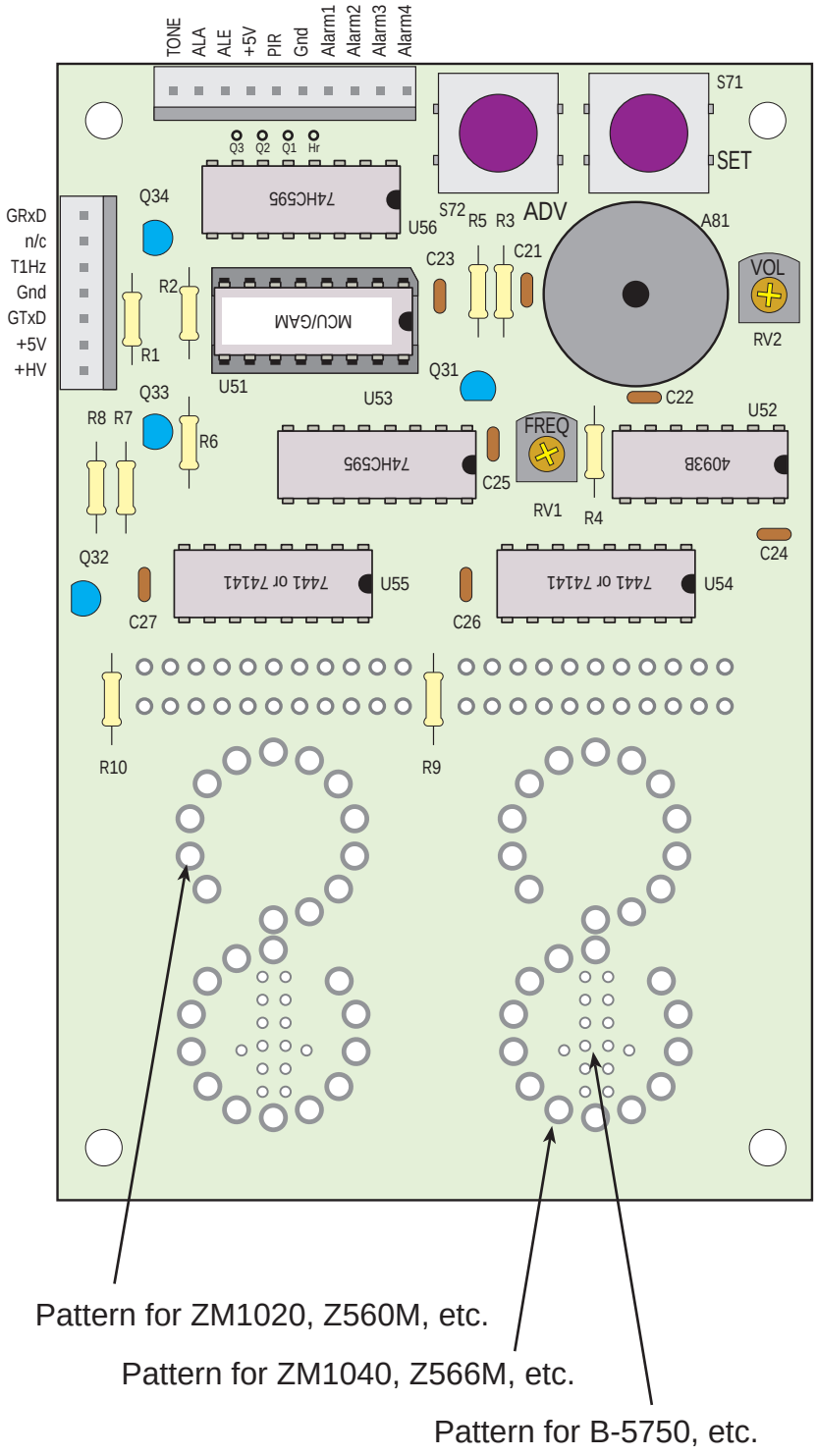
Brief Parts List

A81	Piezo speaker
C21	100 nf
C22	100 nf
C23	100 nf
C24	100 nf
C25	100 nf
C26	100 nf
C27	100 nf
J91	7-pin header
J92	6-pin header
Q31	MPSA42
Q32	MPSA92
Q33	MPSA42
Q34	MPSA92
R1	33k
R2	33k
R3	220k
R4	3k9
R5	33k
R6	33k
R7	100k
R8	2k2
R9	20k to 39k calculated
R10	20k to 39k calculated
RV1	20k
RV2	50k
S71	6- or 12-mm switch
S72	6- or 12-mm switch
U51	microcontroller GAM
U52	4093B
U53	74HC595
U54	7441 or 74141
U55	7551 or 74141
U56	74HC595

Socket pins as required. Recommended type, made by Mill-Max, is: Mouser order no. 575-031600, or Digi-Key order no. ED5012-ND.

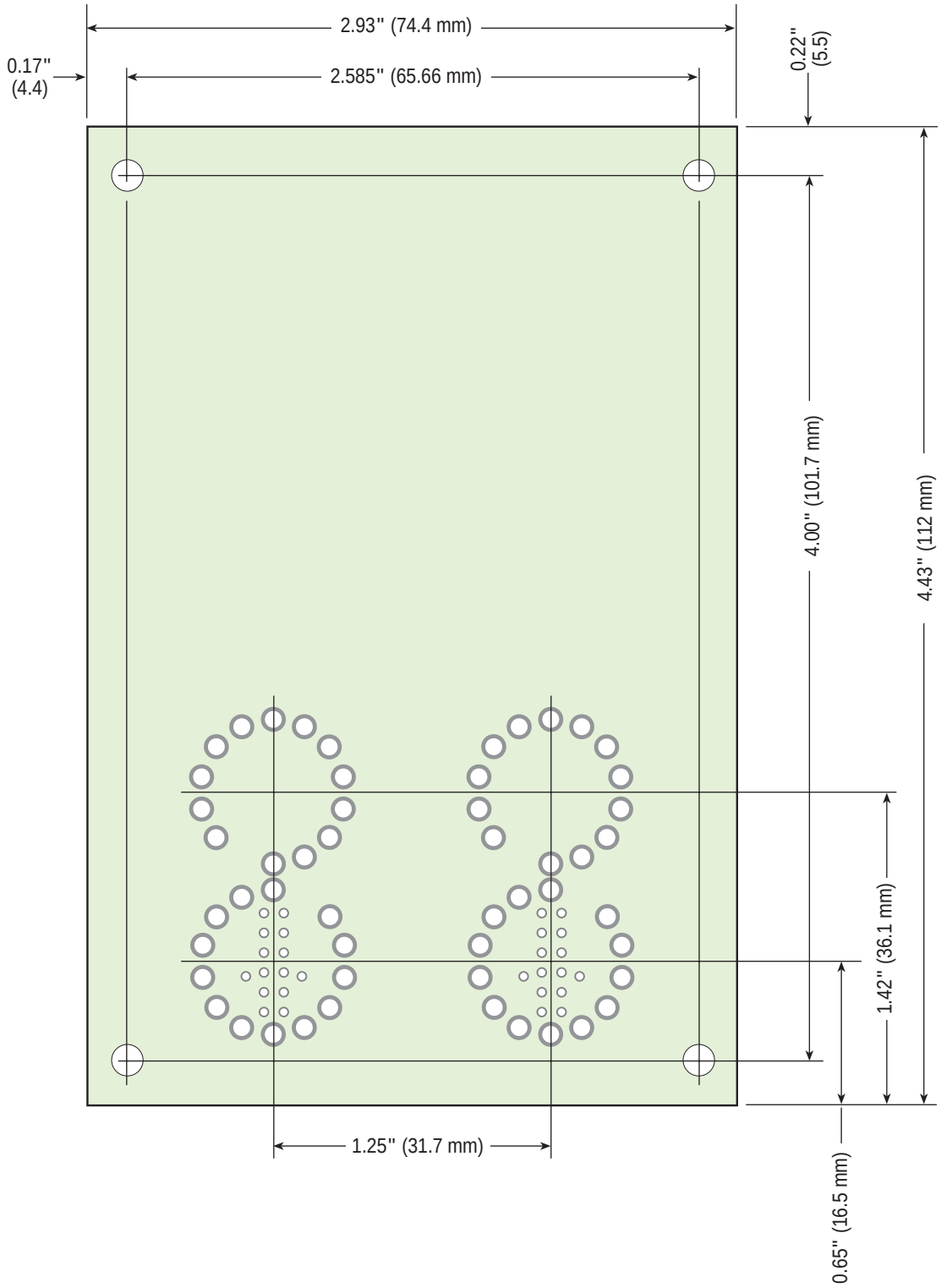
Alternatively these Tyco/AMP socket pins can be used: Digi-Key order no. A29073-ND, or in Europe from: Jan Wuesten (www.askjanfirst.com) order no. FAS900.

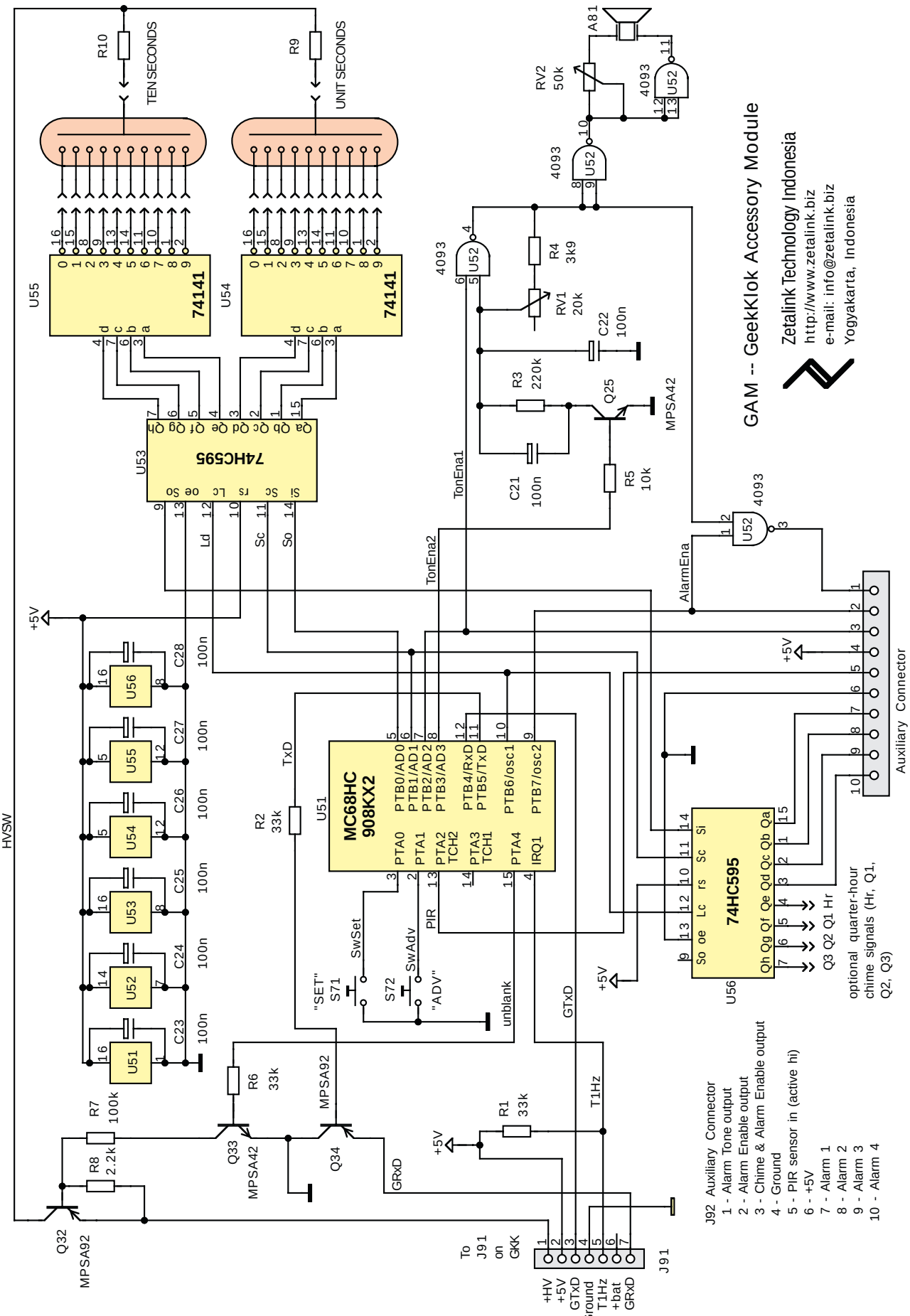
The holes are a perfect fit for either type socket pin.

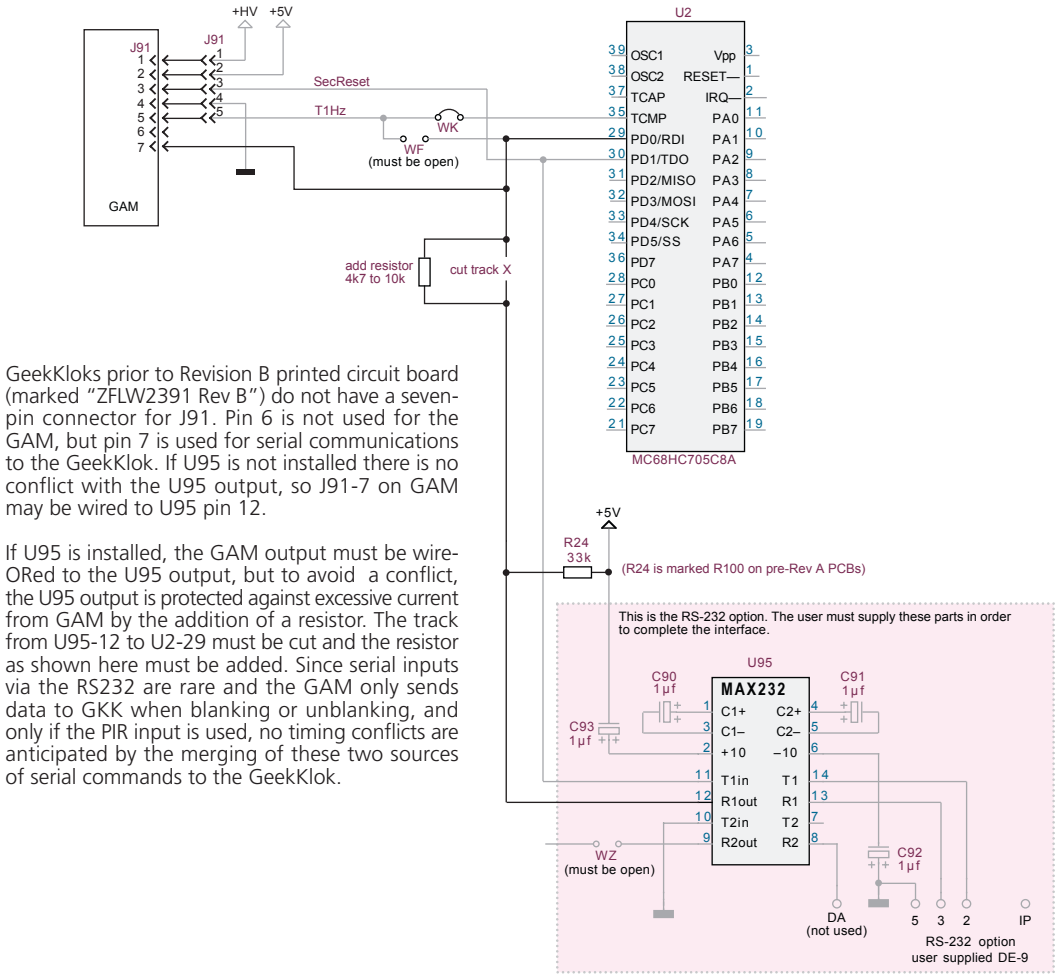


The patterns for the larger plug-in tubes (not the B-5750) take socket pins with 2.2 mm holes (0.086 inches). These include Mill-Max No. 0316-0-15-01-3427100 (Digi-Key order no. ED5012-ND, Mouser order no. 575-031600, or Tyco/AMP part number 1–370759–0 (Digi-Key order no. A29073-ND, Jan Wuesten (www.askjanfirst.com) order no. FAS900). Vintage B13B sockets may be coaxed to work, but none were available to try out. The B-5750 pattern is ***NOT*** on a 0.100-inch grid.

GeekKlok Accessory Module Mounting Dimensions




GAM -- GeekKlok Accessory Module
Zetalink Technology Indonesia
http://www.zetalink.biz
e-mail: info@zetalink.biz
Yogyakarta, Indonesia
MC68HC 908KX2
74HC595
74141
74HC595
4093
MPSA42
MPSA92
TEN SECONDS
UNIT SECONDS
Auxiliary Connector
optional quarter-hour chime signals (Hr, Q1, Q2, Q3)
J92 Auxiliary Connector
1 - Alarm Tone output
2 - Alarm Enable output
3 - Chime & Alarm Enable output
4 - Ground
5 - PIR sensor in (active hi)
6 - +5V
7 - Alarm 1
8 - Alarm 2
9 - Alarm 3
10 - Alarm 4
+HV
+5V
GTxD
Ground
T1Hz
+bat
GRxD
To J91 on GKK
J91



GeekKloks prior to Revision B printed circuit board (marked "ZFLW2391 Rev B") do not have a seven-pin connector for J91. Pin 6 is not used for the GAM, but pin 7 is used for serial communications to the GeekKlok. If U95 is not installed there is no conflict with the U95 output, so J91-7 on GAM may be wired to U95 pin 12.

If U95 is installed, the GAM output must be wire-ORed to the U95 output, but to avoid a conflict, the U95 output is protected against excessive current from GAM by the addition of a resistor. The track from U95-12 to U2-29 must be cut and the resistor as shown here must be added. Since serial inputs via the RS232 are rare and the GAM only sends data to GKK when blanking or unblanking, and only if the PIR input is used, no timing conflicts are anticipated by the merging of these two sources of serial commands to the GeekKlok.

Special Note for GeekKlok using ZFLW2391 Rev A orZFLW2391 Rev – Printed Circuit Boards.

FAQ

Q. The alarm day-of-week selections do not have one for Sunday through Thursday, or Friday and Saturday silent (or some other unusual requirement). How can this be changed?

A. If there are other day cycles that match the pattern, but are offset or shifted by one or more days, such as the Monday through Friday option for the Sunday through Thursday example in the question, then set the DW register in the GeekKlok to a different offset value. The DW register is not used for any calendar or display functions in the GeekKlok and consequently it is entirely arbitrary which day is selected as day 1. The DW register is only used to send day-of-week data to the GAM. It is not generated by the RTC chip based on the algorithmic resolution of the calendar date that is set.

Q. How can I externally differentiate among the four alarms, so that I can make individual and separate indications, operate motors, turn on a coffee pot, etc.?

A. This is supported by connection to pins 7 through 10 on J92. These are raw CMOS outputs and need to have external circuitry added to achieve the desired results. Register settings allow these outputs to have their own individual duration, from one to 99 minutes.

Q. Can I make other chime tones for the different parts of the hour?

A. Between U56 and J92 you will see four holes and solder pads. These are CMOS outputs that are active for one minute for the four quarters of the hour. Additional circuitry will probably be needed to do what is desired with these outputs. They are marked as Hr, Q1, Q2 and Q3 for the 0, 15, 30 and 45 minute points of the hour, respectively.